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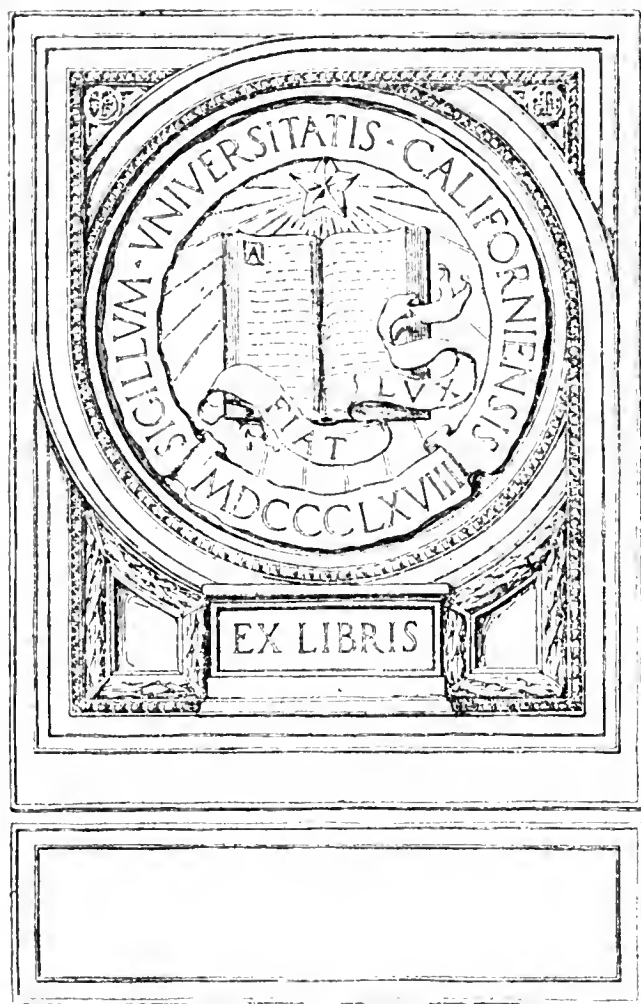
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THE SHATTUCK LECTURE

An Anatomic and Mechanistic
Conception of Disease

BY

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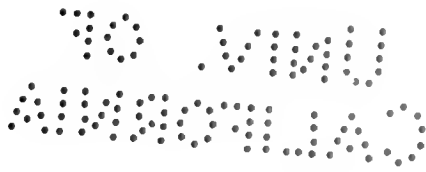
AN ANATOMIC AND MECHANISTIC CONCEPTION OF DISEASE.*

BY JOEL E. GOLDTHWAIT, M.D., BOSTON.

THE subject which has been announced for this, the twenty-sixth lecture given under the conditions of the bequest made by Dr. Shattuck, was chosen after much consideration as being of broad general interest and as having to do with the fundamentals of medical knowledge. It seemed possible that such a consideration might be of sufficient importance to be worthy of the occasion, and if it be so considered it will be a satisfaction to me, as being a slight return for the honor which you have conferred upon me in selecting me as your speaker.

The basis of that which is here presented is work which has been carried on for a number of years in the attempt to find the cause of the chronic disease conditions for which the orthopedist is consulted. A fairly exhaustive pathologic investigation failing to show more than the nature of the lesion, with similar experience from the bacteriologic and the biochemical investigations, led to the study of the fundamental anatomic conditions existing in patients afflicted with these diseases, with results which have been increasingly more suggestive the farther the study has been carried.

* Delivered before The Massachusetts Medical Society at Boston, June 8, 1915.



It is this study which represents the first part of this paper and which has been reported in part from time to time by the writer in articles which have called attention to the variations in the formation of the viscera and skeleton, as well as to the peculiarities of the particular function.¹

In this investigation it soon became evident that the anatomic formation described in the textbooks as normal to the human being, rarely exists in the individual having the common chronic disease, and in the study which naturally followed not only were the different anatomic types recognized, but in the hope of better understanding the variations found, the structure of the lower orders of mammals was studied with considerable care.

Recently, with the assistance of Dr. John Bryant, not only have these anatomic findings been verified in connection with his work,² but the literature has been carefully examined and the fact that most of the elements to be presented have already been recorded has served to increase the belief that the observations here stated are correct and that the appreciation of these elements is absolutely essential if any impression is to be made by our profession upon the great field of chronic medicine which today represents such a reproach to us.

The fact that no more has been accomplished as the result of these numerous contributions to medical literature in the past is probably due to the fact that most of the work is fragmentary in character and that it is only by piecing together many of these separate contributions that the significance of each with the great importance of the whole is realized.

It is the hope, that in this communication, the independent observations which have been car-

ried on by the speaker, may be so strengthened by the similar findings of these other observers that this knowledge may be generally applied to the study of our patients.

In such an investigation, while the first thing that impresses one is that the so-called normal type of human being rarely exists in the chronic patient, the second is that the variations from the normal group themselves into two general types from which again there are many variations, but that if the original type is appreciated the variations from it are easily traced and understood.

In order to understand better the types to be described, it is well to consider for a moment that which from the textbooks we call normal. *Normal Human Type.* (Figs. 1, 2 and 3).

There is very little variation to be found in the works of anatomy in that which is called normal. The torso is of moderate length and of moderate breadth. The thorax is full, and moderately rounded, the upper abdomen is rounded and in circumference about the same as that taken just above the nipple. The costal border is formed in an angle from 70° to 90° . The diaphragm is high and there is generous space under the ribs for the viscera. All of the abdominal viscera, except the lower portions of the colon with the sigmoid and part of the small intestine, are above the umbilicus. Around the viscera and representing a definite part of their support, as well as giving much protection from trauma to the sympathetic nerves, ganglia and blood vessels, are well-defined masses of fat. The lower abdomen is flat, while the upper abdomen is firm and rounded, there being no marked depression under or inside the edge of the ribs. The spine shows a mild curve forward in the lum-



FIG. 1.
The normal human type.



FIG. 2.
Normal human type, showing the normal inclination of pelvis,
normal elevation of ribs, normal position of shoulders, etc.



FIG. 3.
Normal human type, showing the moderate breadth of the body.

bar region, with the inclination backward from the mid-lumbar, this resulting in the general inclination of the abdominal cavity of 30° downward and forward from the perpendicular. The pelvis, in the axis of its cavity, is inclined downward and backward about 60° from the perpendicular so that the two axes form nearly a right angle.

Of the special viscera, the stomach is of the pear shape, and is placed well up under the ribs, occupying the uppermost part of the abdominal cavity upon the left side. In this position the discharge of its contents into the duodenum requires but little effort.

The small intestine is about 20 feet in length, is of good calibre and muscular tone. The large intestine, of five to six feet in length, is adherent to the posterior abdominal wall upon the right side until it reaches the region of the liver, when it turns forward and inward, crossing with a slight downward sag to the splenic flexure well up in the left side of the abdomen behind the stomach, from which point it is again attached to the posterior wall (retroperitoneal) until it reaches the sigmoid, where, after a few turns, it becomes the rectum. The transverse part of the colon is attached to the liver upon the right side and to the stomach in the center of the body and upon the left side. The stomach and liver are naturally attached to the diaphragm, and the suspensory ligament of the diaphragm is the pericardium, especially the right side, which is finally attached to the anterior part of the low cervical spine.

In the upper part of the abdomen in the solar plexus of the sympathetic system, the ganglia being so placed that when the organs are in

their proper position there can be the least possible pressure upon or irritation of them.

These and many other elements are described in the anatomy as normal, and while this type does exist very commonly among those who are well, nevertheless, among the individuals who consult the physician, especially with chronic disease, this type is not often seen, and it must be hard to understand the conditions present in our patients unless their special structural formation is known.

Of the variations from the normal there are two well-marked types which are easy of recognition and are here described.

Splanchnoptotic (Glennard); *Congenital Visceroptotic* (Goldthwait,¹ Smith³); *Carnivorous* (Treves,⁴ Werner,⁵ Bryant²); *Hyper-ontomorph* (Bean⁶); *Macroscelous* (Montessori⁷); “*Narrow-Backed*” (*Industrial*). (Figs. 4, 5, 6 and 7).

The type of human being for which the above and other terms have been used is essentially different from the so-called normal in most of its characteristics. The whole figure is lighter, not only that there is less fat, but the skeleton is lighter and more slender in form. The skin is soft and delicate. The hair is more abundant in the usual places and frequently shows on parts where it is not normally seen. The individual is usually either tall and slender or small and delicate. The head is proportionately large, the face and jaws are narrow. The palatal arch is high. The adenoid and tonsillar tissue is apt to be excessive. The ears are usually large and prominent, projecting outward and forward. The torso is longer in proportion than the so-called normal and is also narrower. (Fig. 6).

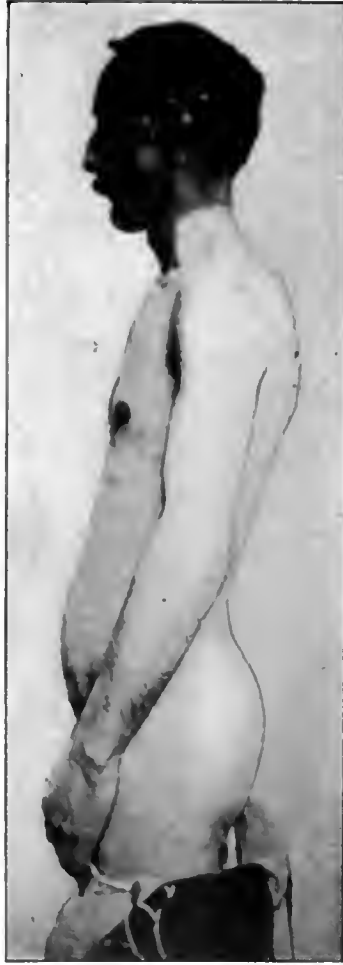


FIG. 4.

The slender congenital visceroptotic or carnivorous type, showing the proportionately greater length of body, the increased low lumbar curve, forward inclination of pelvis, forward position of the shoulder, flat chest, prominent lower abdomen, narrow upper abdomen, forward position of head, etc.



FIG. 5.

Slender type, showing the same features as in Fig. 4, except an increase in the forward inclination of the pelvis and more marked forward position of the shoulder, and a more completely flattened chest.



FIG. 6.
The congenitally visceroptotic type, showing the extremely
slender back.



FIG. 7.
The slender or congenital visceroptotic type in child, showing the same general characteristics as in adult.

The increased length is partly in the thorax, but chiefly in the lumbar region. The ribs are usually longer than is normal, the tenth rib is almost always free, and when seen in the adult, the downward inclination of the lower ribs is very marked, they at times, in the standing position, touching the upper part of the ilia. The spine is smaller in size than normal and the lumbar vertebrae are more like the so-called normal dorsal vertebrae in shape, the body being of about the same width laterally as it is deep antero-posteriorly. (Fig. 8). There are fre-

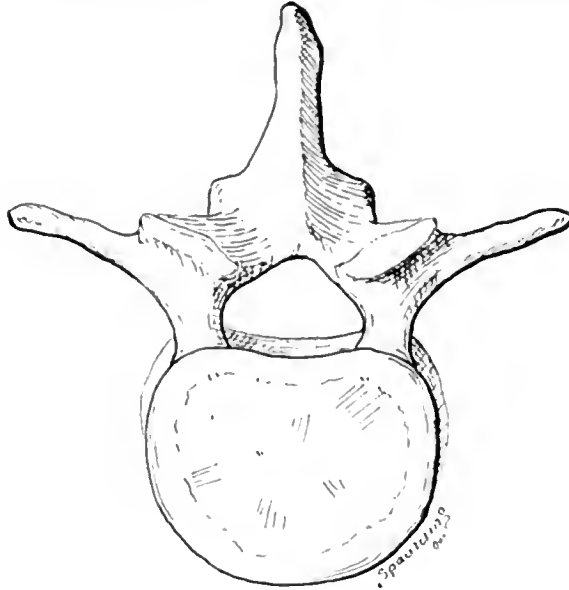


FIG. 8.

Lumbar vertebra in slender type, showing small body to the bone, with slender laminae and with flat articular processes.

quently six vertebrae in the lumbar region with the full number of sacral vertebrae, this being one of the reasons for the greater proportionate length of the body. The transverse processes are small and short and the articular processes are usually flat (not crescentic). Because of this

formation, the lumbar spine is much more flexible than the normal type and it is this anatomic type from which the fancy dancer, the hurdler and acrobat are developed.

The thorax is of fair size, the lungs are apparently smaller than normal, and the smaller size of the heart is easily demonstrated by the x-ray. The abdominal viscera have peculiarities in shape and attachment unlike the normal human. The stomach is long and tubular, instead of the normal pear shape. Its attachments are less firm, so that the possible downward displacement in standing is much greater than normal. The duodenum is usually attached to the normal position, but this is not constant. The small intestine as a whole is much shorter than normal, containing from 10 to 15 feet instead of the normal 20 feet, the walls are less thick, and the lumen smaller. According to Bean,⁶ the length is from 12 to 15 feet; Swaim⁸ from 10 feet up; Bryant² from 10 to 15. The mesentery is longer than normal, so that in standing the small intestine is almost entirely in the upper pelvis or lower abdomen. The large intestine is shorter than normal, from three to five feet, and much more mobile. Almost always upon the right side there is a free mesentery so that this portion may change its position easily, and frequently the left side also has a mesentery, so that in the upright position the entire colon lies below the crests of the ilia. The most common condition, however, is with the normal retroperitoneal position upon the left side with the right side free. The transverse part of the colon is usually attached to the stomach, which means that it will be found below the position of the stomach, even though the stomach may have its lower border in the pelvis. With the transverse

colon, while it is usually attached to the stomach, it frequently has an entirely free mesentery, as is natural with even the purely normal type in the early embryologic state. In this type the vermiform appendix is usually well developed, while in the next type to be described the appendix apparently is much less developed, which may in part explain the common occurrence of appendicitis in the thin, slender individuals. With this type of anatomy there is very little retroperitoneal fat, palpation of the flanks is easy, the kidneys are naturally mobile, the liver is smaller and is more loosely attached than normal.

It is this type of anatomy in which the scaphoid type of scapula (Graves⁹) is found. The muscles are formed of the long and slender fibres. The extremities vary in length as one would suppose in studying comparative anatomy, the carnivora at times having very long legs, as the greyhound, or very short legs, as the otter, but they are usually longer than is considered normal and both arms and legs are relatively slender. The feet are slender and often of unnaturally high arch. The hands are slender but long, the fingers being very slender and tapering. While this type is usually thin, at times there is much accumulation of fat. If this is present it usually develops rapidly, disappearing at times equally rapidly, and the fat is always soft with very little connective tissue and suggests poor health.

Herbivorous (Treves,⁴ Werner,⁵ Bryant²);
“*Broad Backed*” (*Industrial*); *Meso-ontomorph* (Bean⁶); *Brachyscelous* (Montessori⁷).
(Figs. 9, 10, 11 and 12).

Upon the other side of the normal human type,



FIG. 9.

The heavy or extreme herbivorous type, showing the large, heavy build of the body throughout, the relatively straight position of the pelvis, the backward bend occurring in the upper lumbar region rather than in the low lumbar, showing the round-shaped head, flat ear, broad neck, with the shoulder well back on the thorax.



FIG. 10.

The broad backed or herbivorous type, showing the extremely broad body.



FIG. 11.
The broad, heavy type, showing all the general characteristics of
Figs. 9 and 10.



FIG. 12.

The broad, herbivorous type in the child, showing the same general characteristics of position of pelvis, curves of spine, position of shoulder, high chest, prominent upper abdomen, broad face, flat ears, as in Figs. 9, 10 and 11. The position of hyperextension at the dorso lumbar juncture is well shown in this figure.

and in marked contrast to the slender, carnivorous type, is the heavily built, broad backed type of human, in which so many of the characteristics are similar to those found in the herbivorous creatures that this term has been used for their designation.

In this type the body is built upon much heavier lines throughout. The skeleton is larger in proportion and heavier in structure. The muscles are large with coarse fibres. The skin is coarse with scant growth of hair, which is lost early. There is an excess of fat throughout the body, but this is bound together with much connective tissue so that the flesh feels hard and firm in contrast to the soft, flabby feel such as is peculiar to the slender type. The head is round, the face is broad, the jaw is square, the ears are usually placed flat against the side of the head, and as a rule are not very large. The neck is short and thick, the shoulders are broad and square. The body as a whole is broad and relatively short. The chest is larger both in the lateral and antero-posterior diameters than the normal. The diaphragm is high, the costal border is formed in a broad angle, rarely less than 90° and sometimes more. The tenth rib is usually attached to the conjoined cartilages in front and the last two ribs are relatively short. The lumbar region is short, partly because of the frequent presence of only four lumbar vertebrae and partly because the sacrum is set well down between the wings of the ilia. The abdominal cavity is broad and deep. The stomach is large and pear shaped. The duodenum is attached as in the normal. The small intestine as a whole is much longer than the normal, and ranges from 25 to 39 feet (Bryant²). The large intestine is larger and longer than normal, from five to eight

and one-half feet (Swaim^s), with the retroperitoneal attachment of the ascending and descending portions, the added length showing in the longer transverse portion and in the sigmoid. The liver is large but well up under the diaphragm. There is much retroperitoneal and general abdominal fat so that the kidneys are well held in place and the sympathetic ganglia are well protected.

The joints in this type are much less flexible than in either of the other types, the individuals as a whole being strongly and heavily built.

The spine is broad and heavy throughout, but in the lumbar region this is especially noticeable. The lateral diameter of the vertebral bodies in this region is considerably greater than the antero-posterior (Fig. 13), the articular pro-

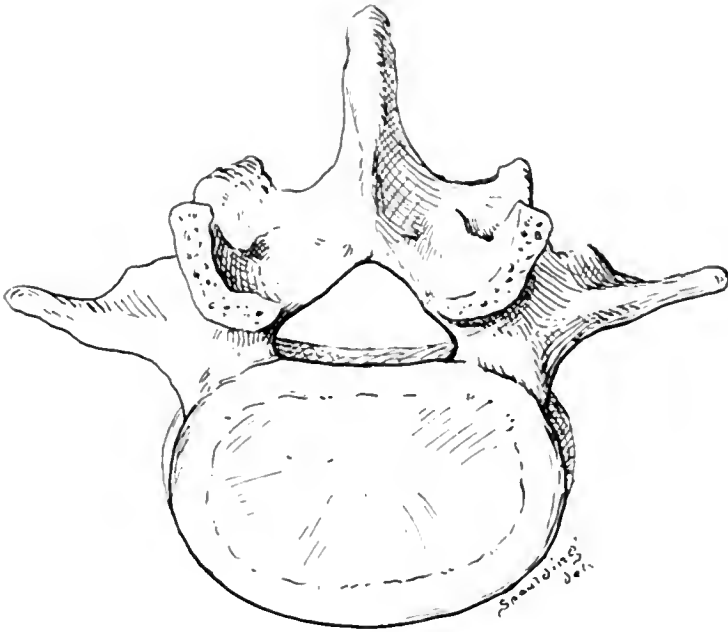


FIG. 13.

Lumbar vertebra of heavy or herbivorous type, showing the broad body and the heavy laminae.

cesses are strong and large and almost always of the crescentic type. The transverse processes are long and broad, and the process of the last lumbar frequently forms an articulation (the lumbo sacral transverse articulation) with the top of the sacrum. The long and broad transverse processes upon the lumbar spine are similar to that which is found in the herbivorous animals and which produces the lateral rounding of the back seen in all the hoof-footed creatures. This formation apparently furnishes protection and attachment for the many coils of intestine in the abdominal cavity.

Because of the shape of the vertebrae and the character of the articulation with the sacrum, there is less lumbar curve forward than is present in either of the other types (Figs. 1 and 2 and 4 and 5), and the forward inclination of the pelvis is also less. The axis of the sacrum is more nearly perpendicular. In this type not only are the wings of the ilia higher than in the normal so that the transverse process of the last lumbar articulates not only with the sacrum, but also at times with the ilium, and in a few cases the transverse process of the vertebrae above also rests against the ilium or has strong ligamentous attachment to it.

The extremities in this type vary in length as one would expect from the study of the comparative anatomy of the herbivorous creatures, but are always heavy. The legs are large, the knees are straight, the feet are broad in proportion to length, and the arch, while it may be very strong is usually quite low. The arms are heavily built, and the shoulder attachment is well back upon the thorax, giving the square shoulder appearance. The hands are broad and "chubby," both in the palmar portion and in the fingers.

Spinal Motions of the Different Types.

Because of the different structure of the bones of the spine, the motions must vary. In the normal, in bending forward the spine is well rounded and laterally there is some motion beginning at the lumbo sacral juncture and extending up to the low dorsal region, while in backward bending considerable motion is allowed. In the carnivorous type this is similar, only the amount of motion is much greater, as would be expected from the description of the bony formation of the type. With the herbivorous type, as must be apparent, the spinal motions are much less free. In this, the forward bending is made largely at the hips, there being but little in the spine. Laterally practically no motion is allowed except at the dorso lumbar juncture, none whatever being allowed in the low back if the lumbo sacral transverse joint exists. If this exists upon one side, no motion at that region will be allowed to that side, while to the other side slight motion may be allowed. In backward bending very little is allowed, and if the lumbo sacral transverse joint exists, none will be allowed at the lumbo sacral juncture.

Such are the three general types which are common in the human family, and as to the fact that such types exist, there can be no question, if the passersby upon the street are noticed, even if one is not willing to accept the statements of those who have studied anatomy in this way. The thin carnivorous person is there side by side with the broad, full-faced herbivorous person, with the normal human also present, and the characteristics are so distinct that nothing more than the glance is necessary to recognize the special form. The characteristics are equally apparent in child-

hood as in adult life, as is indicated by the accompanying illustrations.

The difference in the types and the fitness of each for different forms of work is already known, and a person who is at the head of an organization employing large numbers of laborers states that when an order for laborers is given it is expected that it will indicate so many "broad backs" or so many "narrow backs." The "broad back" is fitted for the ordinary heavy work, while the "narrow back" is fitted for the work requiring greater agility, such as climbing poles or trees, prospecting, running the lines, etc. The "broad back" carries the heavier load, but the "narrow back" carries his lighter load more rapidly.

The difference in the anatomic types is also recognized consciously or unconsciously, in art, and nothing can be more perfectly normal than the early (not always the late) Greek figures, or Michael Angelo's "David," or William Hunt's "Bathers." The type which Rubens almost always depicts is the heavy, full-blooded herbivorous type, while the slender, carnivorous type is the one depicted by Botticelli and Fra Angelico, or by Puvis de Chavannes of the modern school.

The fact that such types exist, but that they also have different characteristics which should be recognized in their training, is shown by Dr. Montessori in her book, "Pedagogical Anthropology," in which the pictures of the types are shown and the intellectual characteristics discussed.

In athletics also the appreciation of the different physical types is clearly understood. The hurdler or the runner is usually of the normal or the slender type, while the hammer thrower, the shot putter or the wrestler is usually of the

heavy type. The heavy men are usually found in the line of the football team, while in the backfield the more slender and agile persons are found.

The types exist, and in a very large number of instances the types are pure, the carnivorous being carnivorous throughout, the normal human being the normal human throughout, and the same is true of the herbivorous. In other instances, however, the types are mixed, and it is here that the greatest difficulty exists in understanding the symptoms or in planning the treatment. A carnivorous type in general build and viscera may have an herbivorous type of spine, a combination which is quite common in women. A carnivorous type of stomach and intestine may exist with a normal liver and kidneys, in so far as shape and position are concerned. The normal type in general may have one or many of the characteristics of either the carnivorous or the herbivorous. The herbivorous type may show characteristics of either of the others and probably the most common variation in this type is the smaller spine and the imperfectly attached colon, but of the full length.

That such differences exist in the anatomic formation of members of the human family there can be no question, and it is not unreasonable to expect such differences if the biologic principles of the development of the race are considered. The human being as the highest type of mammal naturally inherits something of the strains which have shown themselves in the various species through which the advance of the mammalian group has occurred, and it is only by studying comparative anatomy that the various differences of type can be understood.

From the purely medical point of view the

recognition of these different types is important since the types apparently carry their own potential of disease. The tuberculous and the infections in general, the nervous diseases and acute mental disorders, the hyperglandular disturbances, the progressive anemias, the atrophic arthritis, many of the intestinal disorders, etc., naturally are associated with the slender type. The arterio-sclerosis, hypertrophic arthritis, gout, diabetes (not the insipidus), chronic disease of the kidney, gall stones, the prostatic hypertrophy, the degenerative mental disorders, etc., are common to the heavy type. The suggestiveness of this in treatment must be obvious.

Habits of Posture in the Different Types and the Effect upon the Physiology.

Not only has the study of the chronic patient shown that the different anatomic types exist, but that this alone can hardly explain all the phenomena. The more the problem is studied, the more evident it becomes that the life of the creature as an erect biped is a very different thing from that of the quadruped in so far as the function of the different parts is concerned.

One of the penalties that the human being is forced to accept in his being the highest type of mammal, is that in locomotion, with the body used as an erect biped, gravity is constantly operating to drag the organs downward out of their normal position, as well as to draw the upper part of the body downward and forward into positions which must mean strain and weakness. This element, together with the anatomic form, seems many times sufficient to cause the conditions seen in chronic medicine.

The counteracting element, to offset such a handicap and prevent the race from being irre-

parably harmed, is the intelligence with which the human being is peculiarly endowed. The real purpose of such a paper as this is to help in the training of this intelligence so that life may be a period of wholesome, healthy development, with the fullest possible energy available for whatever stress to which the individual may be subjected.

The way the body is used is of quite as much importance as the structure of the body itself. Either type has the potential of good health if used rightly, but each has an equally definite potential of disease if the proper relationship between the many parts is not preserved. With the normal type it is naturally easier to maintain this relationship, but the possibility of not maintaining it is painfully apparent as one goes among one's fellow men. With the other types the special postures or the form of the maladjustment naturally differs as one would expect from the structure.

Since the pathologic changes which are seen are apparently due very largely to this imperfect adjustment of the parts, it is of the first importance that the postures or special elements of maladjustment which are peculiar to the different types should be appreciated. It should also be remembered that with the chronic patient the large majority of the cases fall into the slender, congenital visceroptotic type or the broad, herbivorous type.

The Normal Human.

When the body is used rightly (Fig. 1 or 2), all of the structures are in such adjustment that there is no particular strain on any part. The physical powers are at their best, the mental functions are performed most easily, and the

personality or spirit of the individual possesses its greatest strength.

When used rightly, or fully erect, the feet, knees, hips, spine, shoulders, head and all the portions which represent the frame of the body, are used in balance, with the greatest range of movement possible without strain. In this position the chest is held high and well expanded, the diaphragm is raised, and the breathing and heart action are performed most easily. The abdominal wall is firm and flat, and the shape of the abdominal cavity resembles an inverted pear (Forbes, Williams¹⁶) (Fig. 14), large and rounded above and small below. The ribs have only a moderate downward inclination. The subdiaphragmatic space is ample to accommodate the viscera. In this position, also, there is no undue pressure upon, or interference with, the pelvic viscera or with the large ganglia at the back of the abdomen and in the pelvis.

Relaxed Position.

If the body is drooped or relaxed, so that the shoulders drag forward and downward, the whole body suffers, the weight is thrown imperfectly upon the feet, so that the arch must be strained; the knees are slightly sprung, which shows by the crepitating joints; the pelvis is changed in its inclination, with strain to the sacro-iliac joints and low back. The increased forward curve of the upper dorsal spine results not only in strain to the intraspinous ligaments, but also forces the shoulders forward, with frequent irritation of the bursae about the shoulders, or compression of the brachial plexus, with pain and neuralgias in the arms, while the craning forward of the head must result in strain to the posterior part of the cervical spine.

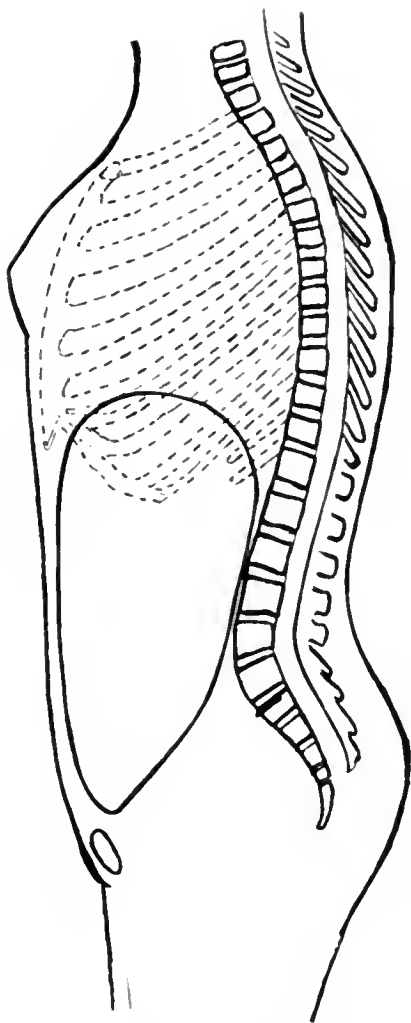


FIG. 14. (Williams.)

In this position the chest is necessarily lowered, the lungs are much less fully expanded than normal, the diaphragm is depressed, the abdominal wall is relaxed, so that with the lessened support of the abdominal wall, together with the lowering of the diaphragm, the abdominal organs are necessarily forced downward and forward. When this occurs the possibility of mechanical interference with the function of the organs is not difficult to imagine, and it becomes apparently a mere matter of chance which organ is affected.

The thing that is important in the interpretation of the many symptoms which the patients describe is that the body is most intimately related in its different parts so that no one part can be used wrongly without the body as a whole suffering. For this reason, if these various groups of symptoms are to be considered as purely local and distinct lesions, the results are sure to be unsatisfactory. The body as a whole should be considered and not just the chest or the abdomen or the feet or the back or any one part, and it should be considered with reference to use in the different positions in the routine of life, especially those which are maintained for long periods, the occupational postures. In sitting it is perfectly possible to sit so that the trunk is in practically the same shape and with the different parts in practically the same relation, as they are when the body is used fully erect. At the same time in sitting it is very common to have the body markedly drooped, so that the body is rounded forward with the lumbar spine entirely reversed in its curve, with the ribs low, so that the thorax practically telescopes into the abdominal cavity. When such a position is studied with reference

to the mechanics of the function of the organs the wonder is not that disturbances result, but that the disturbances are not more marked.

In such a study of the mechanics of the physiology, the positions assumed when the patient is lying down should be investigated. It is perfectly possible to produce practically the same effect upon the shape of the body and upon the thoracic and abdominal cavities that is present when the patient is sitting in the slouched position, if when lying down several pillows are placed under the head and shoulders, as is so frequently seen. In such a position naturally the breathing and circulation, the digestion, and the other physiological functions cannot go on rightly, and the restless, dreaming sleep is many times due to no other cause than this.

The importance of the proper relationship of the parts should be borne in mind under all conditions, and especially at the times of occupation or when the postures are assumed for continuous periods. It is under such conditions that naturally the greatest harm results, and it should be remembered that irrespective of the type, the postures which are assumed as the body is used determine very largely whether the individual is to be well or ill. *The most perfect, anatomically, may have the poorest health, while the most imperfect, anatomically, may have good health.* Fig. 15 is of the normal type as is shown when the body is held erect (Fig. 16) but the posture commonly maintained (Fig. 15) suggests very little of normal vigorous health.

The postures which are assumed by the other anatomic types are perfectly characteristic, so that once they are appreciated, the posture itself very largely indicates the type of anatomy



FIG. 15.

The normal human type, with acquired habits of bad posture, with marked visceroptosis, drooped shoulder, etc.



FIG. 16.

The same case as Fig. 15, except that the body is held at attention, showing the way the viscera are drawn up under the diaphragm, giving the normal lines of the body when the body is held erect.

to be found in the individual. It is always to be remembered that while the type is present at the time of birth, that the extreme characteristics which are seen in adult life are largely the result of stretch and strain due to the downward displacement which is the rule if the body develops without guidance. As long as the child remains a quadruped, as it is in the first two or three years of life, the special peculiarities are of very little concern, but as soon as it begins to assume the erect posture for long intervals the peculiar postures begin to show and the symptoms which naturally result therefrom begin to develop.

The Congenital Visceroptotic or Carnivorous Type.

In the slender type, while the ideal standing position is the same as with the normal human, the natural position which will be assumed is one in which the general relationship of the parts is much disturbed (Figs. 4, 5 and 7). In this type the chest is flat, the usual standing position being with the chest at full expiration so that all breathing is done from the low point. The sternum is more nearly perpendicular, instead of the forward inclination, which is normal. The costal border is inevitably narrower than in the normal type, the angle being usually under 45° while at times in adult life it is so slight as to be hard to insert the fingers between the costal cartilages of the two sides. Because of this position of the ribs, the upper abdomen is naturally very small and the abdominal viscera must be in a different position from that seen in the normal type. The general shape of the abdominal cavity resembles the normal pear (Forbes, Williams¹⁶), large below and narrow

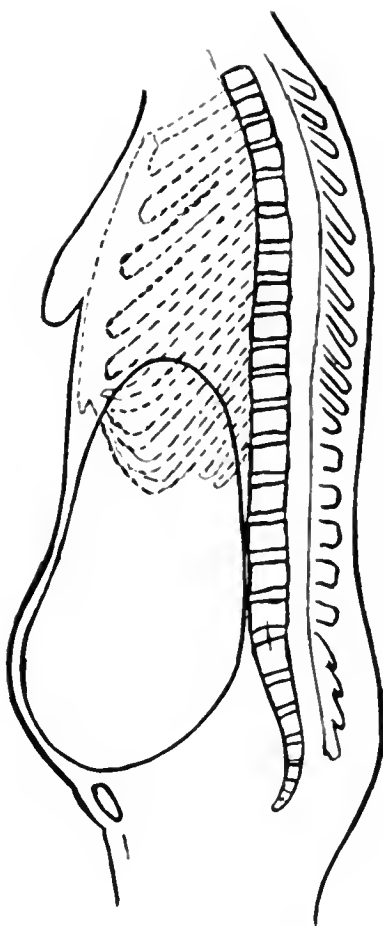


FIG. 17. (Williams.)

above. (Fig. 17). Because of this the liver is displaced downward and it is usually rotated to the right, so that the right border is frequently below the crest of the ilium. The retroperitoneal fat is practically entirely lacking, with the result that the kidneys are usually mobile, the position occupied depending entirely upon the position assumed by the individual at the time of examination. Because of the absence of the retroperitoneal fat, the sympathetic ganglia and the large blood vessels must lie unprotected upon the anterior part of the spine, and it is not improbable that the changing positions of the organs, in the changing positions of the body, must at times lead to irritation or harmful pressure of these ganglia or vessels. The same thing is probably true of the adrenals, which, being unprotected by fat pads, must be pressed upon and irritated more than is normal, this mechanical disturbance possibly explaining the peculiarity of the structure of the adrenal in this type of anatomy, which has been described by Dr. Bryant.

In this type of anatomy, since the ribs are lowered in front, the diaphragm must be lower than is normal, and this is increased by the drag of the loosely attached stomach, liver and colon. Because of this, the movement of the diaphragm in respiration must be less than normal, with, at times, practically no movement whatever showing in the Roentgenological study. The effect of this upon the breathing, as well as upon the circulation, especially in the large abdominal veins, to say nothing of the function of the other organs, must be very apparent.

The constant position assumed by this type is with the body inclined backward from the low lumbar region, making a sharper curve in

the low spine than is normal, the spine above this point being relatively straight to the upper dorsal region, from which point it bends sharply forward to the midcervical region, where it bends backward again to make the upright position of the head possible. (Figs. 4 and 5). The general impression created by such a position when the individual is dressed is often that of being quite erect. In this position with the ribs low in front there is imperfect support for the shoulders, so that they are drooped forward (Figs. 4, 5 and 18), the scapulae being rotated outward at the top, so that their long axis is much more oblique than normal. In this position the upper part of the scapulae does not rest against the ribs, and since the position exists in childhood when the bones are soft, the unsupported upper part usually is flexed forward, this flexed portion rubbing over the ribs when the shoulders are extended and gives rise to the sensation of crepitation so commonly felt. This irritation if continued naturally causes the pain so frequently referred to this region. With this general posture there are two regions of the spine, the low lumbar and the low or midcervical, in which the degree of hyperextension is greater than is normal, and since in hyperextension the posterior portions of the vertebrae, must be brought closer together than is normal, and since the foramina through which the nerve roots pass are posterior to the point of motion, it is obvious that in this position the foramina must be narrowed. Since this position is the habitual one with this type it is not impossible that some of the little understood symptoms referred to the arms and legs (the parts naturally supplied with sensation and motor control from these two hyperextended regions) or some of



FIG. 18.

The slender, congenital visceroptotic or carnivorous type, showing the forward position of the shoulder, with marked rotation of the scapula. In this position the head of the humerus is lowered and rotated inward so that it rests against the second rib, and the possibilities of crowding the vessels of the arm or the nerves of the arm leading to the circulatory disturbances, neuritis, or neuralgias of the arm, are evident.

the circulatory disturbances of the spinal cord may be due to this anatomic position.

With this hyperextension of the lumbar region and the backward inclination of the upper body, the longitudinal axis of the abdomen is naturally moved backward at the top, but at the same time the pelvis is tipped forward and downward (Figs. 4 and 5), so that its longitudinal axis is moved forward at the top (Fig. 19). The result of this is that the hips stick out at the back more than is normal and the angle

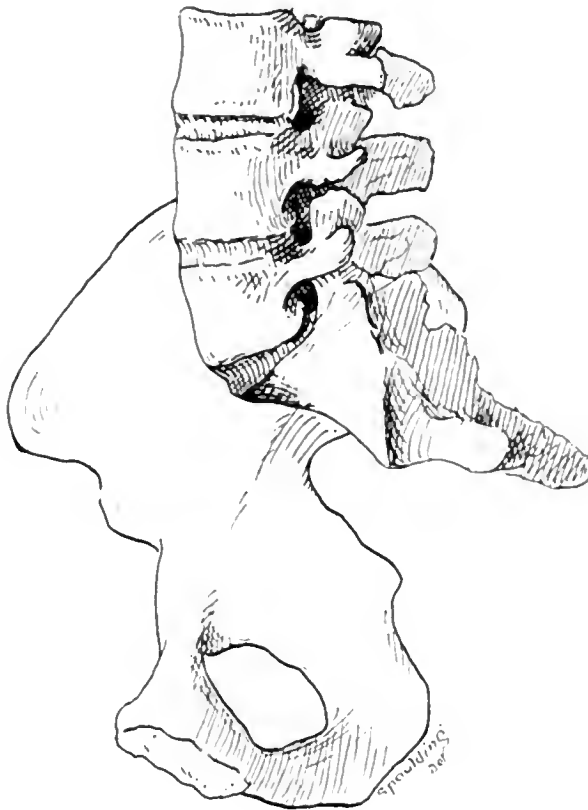


FIG. 19.

Spine and pelvis, with left ilium removed, of slender or carnivorous type, showing the marked forward inclination of sacrum. The weight of body must be thrown upon the front of the sacrum, and naturally leads to sacro-iliac strain or displacement.

formed by the intersection of the two axes, pelvis and abdomen, is less than is normal. In this position the pelvis has its forward inclination changed so that it at times is from 30° to 40° away from the so-called normal position. Naturally in this position the upper part of the sacrum, upon which the spine rests, is moved forward and downward and the weight of the body constantly tends to increase this forward position with resulting abnormal strain to the sacro-iliac joints. This being the case, it is not surprising that it is in this type of anatomy that the strains and displacements of the sacro-iliac joints are most commonly seen.

With this general peculiarity of poise, the weight is naturally thrown upon the feet wrongly, so that the usual high arched foot is markedly pronated and the knees are sprung, usually with some knock knee.

In considering the mechanics of the viscera, naturally the same conditions as to position or mode of use of the body apply as were indicated with the normal human type. The special thing to be borne in mind in this slender type is that all the disturbances of poise are more easily harmful than would be true with the normal human or the more stockily built types. Particularly it is desirable that the positions assumed at night should be considered carefully. The absence of the posterior abdominal fat pads which fill up so much of the lateral spinal spaces naturally allows the loosely attached organs to drag backward much more than is possible in the normal type. This, together with the lack of protection of the ganglia and the blood vessels upon the front of the spine makes mechanical pressure more easily possible than occurs in the normal. It is not improbable that it is this

drag or pressure upon these structures during the periods of complete relaxation in sleep that explains the common subnormal temperature, with the weak pulse, the low blood pressure, and the general lack of vitality which is usually present with this type of individual in the morning. For this reason it is particularly desirable that this type of individual should sleep either face downward or upon the side, so that the drag of the organs tends to pull away from the spine rather than to press backward upon the spine, as would be inevitable if the back position were assumed. The same possibility of backward pressure upon the ganglia or vessels is to be carefully borne in mind at times of operation upon this type, and the back position after operation be maintained as little as possible unless there is some support planned for the low back and loins.

With this type it should be remembered that good poise is possible (Fig. 20, the same child as Fig. 7), but that it requires greater effort on the part of the individual and greater patience on the part of the helpers than would be required by the normal.

The Broad-Backed, Herbivorous Type.

With this type of anatomy the harmful disturbances of poise as a rule develop much later in life than with the slender type, because the shape of the spine and the general structure of the body withstand strain much longer than the more lightly built creature. In childhood the general posture is with the body erect and in good poise, not unlike that assumed or considered desirable in the normal type.

With this heavy type the disturbances of pos-



FIG. 20.

The same case as Fig. 7, showing the possibility of the erect posture, but showing the marked hollow under the ribs as the result of the low position of the viscera.

ture come about chiefly because of the abnormally large and heavy abdominal viscera. This leads to the backward inclination of the body as the weight of the abdomen increases, but since the formation of the low lumbar spine, with this type, does not allow of backward bending, the inclination takes place either from the hips or at the dorso-lumbar juncture (Fig. 9). The strain produced upon the low back as the result of the posture may lead to marked sensitiveness at the lumbo-sacral juncture, due either to the crowding of the transverse process against the top of the sacrum with the irritation of the bursae which so commonly lie between, or to the irritation of the articulations formed by the articular processes, or by the crowding together of the spinous processes with the pinching of the intraspinous ligament. Many of the cases of lumbago are undoubtedly to be explained by such strain.

In this type of anatomy the inclination of the pelvis is never forward more than is normal, but is apt to be thrown backward at the top since the pelvis moves with the low spine, and since the backward inclination usually takes place at the hip joints instead of in the lumbar spine. With such a backward tendency, if one of the transverse processes is larger than the other, or if the lumbo sacral transverse articulation exists upon one side, or is more marked upon one side than the other, or if the articular processes are peculiar in shape, so that one is crescentic while the other is broad, it is obvious that with the backward inclination, the body is thrown to the side, with at times a marked lateral deformity. It is in this type that the so-called sciatic scoliosis is so often seen (Fig. 21). The symptoms which would naturally result



FIG. 21.

The broad backed, herbivorous type with the lumbo sacral transverse joint upon the left side, with strain and irritation of this joint, resulting in marked list of the body, with much pain in the left leg, and partial paralysis of the anterior thigh muscles, the so-called sciatic scoliosis.

from this would be pain, not in the sacro-iliac joints as in the other type, but at the lumbo sacral juncture, and especially over the lumbo sacral transverse regions. The referred pain will be along the anterior cural nerve or the distribution of the nerves coming from the lumbo-sacral cord, that naturally being the nerve most commonly irritated as it passes under the transverse processes of the fifth lumbar vertebra.

With this type of anatomy the sternum is always carried high so that the chest is more rounded than in the normal human type and the diaphragm is held high, largely because of the bulky viscera which occupy the upper part of the abdomen. As years go on the heavy organs naturally lead to stretching of the abdominal wall so that the viscera occupy a lower level than is normal, but the degree of sag in this type is markedly less than is seen in the slender type with the loosely attached viscera. It should be remembered, however, that the degree of displacement is not that which determines the severity of the symptoms, and that at times the sag of an inch of an organ may produce more serious difficulty than the sag of several inches.

As the organs sag downward, the ribs, while lowered somewhat, are naturally flared at the bottom because of the high attachment of the organs and the fact that the amount of downward displacement that is possible with them is relatively slight. The antero-posterior diameter of the upper abdomen in this type is relatively but little changed by the drooped position over that which would exist when the body is fully erect. On the other hand, in the slender type the antero-posterior diameter of the upper abdomen is much less when the body is drooped

than when fully erect. The costal border in this heavy type of anatomy is always broad and usually is more than 90° rather than less.

With the heavy type the positions assumed when sitting are as a rule much less serious than with the slender type, since the structure of the body as a whole makes the droop much less marked, and since in the sitting position the lower abdomen is partly supported on the upper thigh and the downward drag of the organs thereby somewhat lessened.

The position at night is naturally of importance, and with this type the position upon the face would cause so much backward pressure upon the viscera and structures at the back of the abdomen that probably harm would result. The back or the side position is naturally the best. Since the lumbo sacral region is the part most commonly strained in this type of anatomy, the back ache in this type or the referred leg pains are usually relieved by recumbency, the reverse of this being true with the slender type, in which with the sacral strain the day time is the time of greatest ease, the night being the time of greatest discomfort.

Deductions.

If that which is here stated is correct, and verification of the statements should not be difficult, it means, in the first place, that the teaching and study of anatomy should have to do not only with the normal type, but that the other types should be given similar recognition. The need of this broader anatomic training must be obvious when one appreciates how rarely the physician is consulted by the person having the anatomy as it is commonly taught.

It means, also, that in the study of physiology the elements which are peculiar to each type should be investigated and appreciated. When the elements which are easy of study, such as the gastric secretions, the blood pressure, pulse rate, temperature, etc., vary so markedly with the different types there must be similar and perhaps more important variations in the other features which are part of our physiology. To study all individuals from the same point of view must lead to much confusion and explains in part the different reports which are made of seemingly similar investigation. With the types so widely different it is not difficult to believe that there is wide variation in the function of the different parts. The physiology as a whole should be studied with this in mind. The temperature, blood pressure, and other elements of this sort should be observed, but also the problems, such as the mechanics and peristalsis of the stomach and bowel, with the time involved in the passage of food from one part to the other. These must vary, and each type should be studied by itself, since it is obvious that study of one type would be of very little assistance in interpreting the symptoms or functions of another. This must be particularly true of the chemical observations and it must be obvious that in beings having so much the makeup of creatures so widely different as the carnivora and the herbivora there is probably enough of difference in the body metabolism as to make such studies of uncertain value unless the anatomic type of the creature studied is stated.

It means that probably in this difference in types is to be found the explanation of the varying effects of the same diet upon groups of individuals. That one becomes fat while the

other remains thin, or that one suffers distress while the other thrives upon the same food must be due to something other than the food. The fact with which even the laity is familiar, that meat in gout is harmful becomes a matter of interest when it is realized that the herbivorous type is the one that is subject to gout. Also the fact that a few years ago so many of the nervous invalids were helped by the diet of chopped red meat and hot water of Dr. Salisbury becomes interesting, since this type of patient is almost always of the carnivorous type. It apparently means that while all human beings have elements within them which make possible the digestion of the different kinds of food, some are digested with greater ease than others, and that this fact at times is of the greatest importance in the interpretation of symptoms and their treatment.

It means in the medical and surgical treatment of our patients that the symptoms should be interpreted in relation to that which is normal for the special type of anatomy represented in our patient, and that the mechanical conditions present in such a type should be carefully studied. A blood pressure, for instance, that would be normal for one type might be dangerously high or dangerously low for the other type. A disturbance of circulation in the legs, the varicose veins, or in the lower abdominal structures, varicocele, etc., should be thought of not as a local condition, but investigation at once started to see what is pressing upon or interfering with the veins above. Correction of sagging organs, or the removal of some pelvic tumor may wholly relieve the mechanical interference with the veins with entire relief to the conditions below. The treatment of the vein itself, since it

is treating a symptom only, must necessarily be unsatisfactory.

In thoracic conditions, it means that not only should the disease of the organ itself be considered, but the conditions under which the special organ works be also considered. In the slender type, since the chest is used at full expiration and since the movements of the diaphragm are also restricted, the lungs should not be expected to become strong or to work rightly until the conditions upon which the proper action of the lungs depends are made possible. With the tuberculous patient, which almost always is of this type, it should be made a part of our work to see that the body is so used and supported that the chest is raised, and the drag upon the diaphragm removed, so that the normal rhythm of respiration is possible, as much as to see that the patient is given fresh air. The air cannot get into the lungs unless these mechanical elements are recognized. The same is true of the heart action, if the chest is low, and the diaphragm depressed so that the suspensory ligament, which is the pericardium, is stretched. Not only must the heart labor at a disadvantage from its immediate environment, but the interference with the diaphragmatic action must be of much importance, and for only one illustration, the unloading of the abdominal veins, which is dependent so much upon the movement of the diaphragm, must be disturbed. When the mechanics of the heart action is considered one is not surprised to find such work as the article by M. Herz¹⁰ upon "Interference with the Heart Action by Stooping," reported.

In the abdominal conditions it means that they should be given proper anatomic and mechanistic consideration. It may be that the

individual is simply receiving food that is designed for an entirely different type, or it may be that the organ or organs are so mechanically out of adjustment that the normal function is impossible. The imperfect action of the liver or the formation of gall stones may be due to mechanical interference with the structures upon which the function depends. The fact that gall stones are found so commonly in the heavy type, while the cystic bladder is seen so commonly in the slender type, probably means something which has both a physiologic and a mechanistic significance. The inability of the stomach to empty itself, or the variations in the character of its secretions, may be due to the position of the organ itself or to interference with the vessels or nerves supplying it. The function of the bowel, both large and small, may be good or ill in proportion as its structure is normal or its position is correct. Kinks may occur, but it should be remembered that while some are serious and require surgical interference, that many times if the mechanistic features are appreciated, that the kink can easily be released, while if surgery is employed, the special kink may be removed but the structural formation is such that other kinks are possible, with a greater probability of their developing because of the post-operative adhesions which are sure to be added to the structural peculiarities. The ulcers of the stomach or duodenum may be due to improper pressure, as has been fully described by Codman.¹¹

It means in the part of the study in which the x-ray is used, that the difference in the position of the viscera that should be present when the body is recumbent upon the side or back, as

well as that which should exist when the body is erect, should be fully understood.

It means that with the disturbances of the kidneys, that those which are mobile should be expected as a part of the anatomy of the slender type, and that attempted suture of such organs can hardly be successful unless there is much postural training, since all of the mechanics tend to displace them. In the so-called diseases of the kidneys it should be remembered that albumen and the other abnormal elements are only symptoms of a condition, and may be due to improper demand put upon them by the wrong food, or may be due to some purely mechanical condition. When the anatomic features are considered as well as all the mechanistic features, one is not surprised to find such work as Seholder and Weith¹² carried on at Lausanne, showing that in 1254 school children, in over 20% they were able to obtain albuminuria by putting the children in certain definite postures. Similar work by Fisehl and E. Popper¹³ upon albuminuria is of additional suggestiveness.

With the presence of sugar in the urine it is not impossible that as well as improper food the pressure of the mobile, heavy organs upon the pancreas, or its blood vessels, may be distinctly causative of the symptom. Certain it is that when one has seen cases in which after most careful dieting the sugar has persisted and then after supporting the organs properly the sugar has wholly disappeared, it is hard to believe that the mechanistic elements are not of some importance. It should be remembered that the diabetic is almost always the heavy type and that sugar is rarely present in the slender type, except occasionally in childhood, and then

only in an evanescent manner. In this heavy type the organs are heavy and are placed in the upper abdomen, while in the slender type they are much lower. One cannot help wondering if the heavy organs, by sagging, may not crowd the pancreas or the sympathetic ganglia of that region with etiological importance. The supports or postures which are used should be planned with reference to this.

It means, in considering the blood diseases, especially the profound anemias, which cannot be explained in other ways, that the position of the spleen or the effect which other organs may have upon its function should be considered. The ease with which the blood supply of this organ could be shut off or interfered with as the other organs move about, must be apparent, while the possibility of the spleen itself being displaced or its vessels twisted, must be equally evident as we come more and more to understand the mobility of the various viscera. The fact that the blood recovery has taken place rapidly after mechanical treatment has been applied, after the previous continuance of the symptoms, in spite of the ordinary medical measures, makes it seem probable that to make it possible for the organ to work, is perhaps as important a part of treatment as any other.

It means that with the disturbances of the other abdominal organs that both the anatomic and the mechanistic features should be considered; that the stomach and liver cannot work rightly if the ribs are contracted and narrowed so that there is practically no subdiaphragmatic space; that the pelvic organs cannot work rightly and must be congested if the loose abdominal organs are crowded into the lower abdomen and pelvis.

It means that in studying the mental diseases or the nervous disorders, since with the former the acute conditions are usually seen in the slender or carnivorous type, while the chronic or degenerative conditions are usually seen in the heavy type, in which the arteriosclerotic changes are common, and since also the functional nervous conditions are usually seen in the slender type, that probably the anatomic form is of distinct importance in the understanding of such conditions. It is not improbable that the acquired characteristics, with the mechanical disturbance of the physiology which is to be expected under such conditions, may be of distinct etiological importance.

With epilepsy, the recent literature so strongly suggests that many of the cases are due to gastro-intestinal derangements that it is not unreasonable to wonder if, by studying the anatomic condition fully, we may not find suggestions that will be helpful in our treatment. From the mechanistic point of view, when occasionally one sees the convulsions stop instantly by the mere change of position to that in which there would be less pressure of the viscera upon the ganglia and vessels in the posterior part of the upper abdomen, it makes one question if these mechanistic elements are not part of the complex condition that shows itself in the convulsion.

It means that in studying the disturbances of the internal glands that since the hyper-thyroid conditions are usually seen in the slender type, while the hypo-thyroid conditions so commonly occur in the heavy type, it is possible that in the better understanding of the physiology of the whole body with such an anatomic

basis, our treatment of these conditions may be more satisfactory.

It means that in studying such local conditions as the disturbances of the eye, it should be appreciated that the circulation in the eye may be so materially changed by postures which interfere with the blood flow to the head that the shape of the eye is changed, the near sighted eye resulting (Howe¹⁴). In such diseases as cataract, since these commonly develop in the heavy or herbivorous type, as is true of the hypertrophic arthritis, perhaps there is something else to be done other than wait for suitable time for operation. With such understanding of the anatomic types and their physiologic potentials, one is encouraged in such hope by work such as is reported by Connor.¹⁵

With some of the other inflammatory conditions of the eye it is not improbable that the function of the ophthalmologist will extend much farther than the application of the local remedies, but that a kink in the bowel leading to an eye infection or the interference with the circulation in the eye as a result of some local mechanical feature may be the real cause of the trouble and that his greatest function is seeing that these conditions are corrected.

It means, in obstetrical work, that the different types have very different potentials. The slender type of woman is, as a rule, in better health than usual during pregnancy, after passing the first month or two, undoubtedly in part due to the support which the abdominal organs receive from the enlarging uterus. The labor also is usually easy with this type, as one would expect from the small amount of pelvic fat, the slender or small fibred pelvic muscles, and the slender pelvis with the loose pelvic joints. In

the last month of pregnancy the sacral pain with frequent sciatica is easily understood by the form of the pelvic joints, and the quick relief from the pelvic joint strapping is not surprising. The possibility of increasing the diameters of the pelvis in this type and thereby assisting at the time of labor, by simply manipulating the sacrum should be realized, as well as the greater need of pelvic support, by swathe or strapping while the involution is going on. Also with this type, to maintain the higher position of the abdominal organs, the upright position should not be assumed until the abdominal wall has regained its proper tone and suitable corsets, to give low abdominal support, are fitted. It should be appreciated that conception with this type occurs easily and large families are common. With the heavy type childbearing is a more difficult matter, conception occurs less frequently, and the pregnancy is usually a time of much discomfort, with distressing back ache due partly to the relaxing of the broadly formed sacro-iliac joints and partly to the strain of the broadly formed lumbo-sacral joint, due to the changing poise. The labor is usually difficult, partly because of the general lack of flexibility of the pelvic girdle and the low back. It is with this type that back ache with referred leg pains often last for long after confinement because of the chronic joint strain.

With the normal human type the obstetrical condition is midway between these two types. It is neither as easy as with the slender nor as hard as with the heavy type.

It means that with the orthopedic conditions not only should the special joint or part be protected, but the type of the being as a whole should be studied and the function of the dif-

ferent parts assisted as much as possible. In the fitting of apparatus this is particularly important, and anything that interferes materially with the visceral function or with the proper development of the body as a whole should be most carefully avoided. This should be especially considered in some of the newer methods for the treatment of lateral curvature.

It means that, in the treatment of the common weak foot conditions, cure can hardly be expected unless the elements of faulty mechanics which have led to the foot strain are corrected. Of these, among the seemingly remote causes of strain, it should be remembered that the abnormal drag of the abdominal viscera will necessarily throw the body out of poise, so that the balance of the feet will be disturbed. It means that in the treatment of the common strains of the sacro-iliac joints that cure is not to be expected unless the abnormal forward inclination of the pelvis which has led to these strains is overcome. It means that in the treatment of the chronic joint diseases that the treatment of the local condition is only part of the problem. The joint symptoms are usually due to some systemic disturbance. To find the primal cause of the difficulty and see that it is corrected is naturally the most important function of the orthopedist.

It means, and this is apparently the most sobering phase of the subject, that as the result of the splendid work of our profession in preventive medicine, the slender type, which formerly because of its low resistance added so much to the mortality of infancy and childhood, is now being saved. It means also that with this type growth without proper guidance inevitably produces a still weaker physique, with

drooped figure, narrow chest, etc., etc. These acquired characteristics added to the congenital form accentuate the congenital elements to such an extent that they are much more sure of being present in the following generation, and it becomes a mere matter of biology to see that such elements which represent physical instability will become more and more marked in the subsequent generations. This together with the fact that the slender type is the most prolific, makes evident that the stock from which the race is recruited will become steadily less strong. That this is actually taking place, one has only to study any considerable group of school children of the present time to see how commonly the slender type is found. That this was not formerly the case is suggested, at least, by the study of the engravings of groups of individuals, such as were so commonly made from 50 to 100 years ago, in which the broad or round faced type is almost the only one shown. This is, of course, equally true at the present time in those countries in which modern medicine has exerted but little influence, and consequently the infant or child mortality is extremely high. The similarity in the form of the Oriental is apparently to be explained largely by this, as is true also of the form of the pure African. The slender type is not often seen among these races.

Since with the work of our profession and the general development of our civilization, the structure of the human family is being modified, it certainly behooves us to see that the modification is beneficial and not harmful. For this reason the great opportunity for our profession consists in not only saving the lives of those who are physically delicate, but in seeing that

they are developed into stronger and more healthy individuals.

Similarly this is the great opportunity and responsibility for the educator. The slender child, if guided and trained rightly, becomes the agile, quick moving, quick thinking type of individual. To obtain such a development means most constant perseverance with the education and training of such a child, and this training should begin in the lowest grades of our school system, insistence being put always upon poise with its resulting efficiency. If the proper exercises are started in the lower grades and are increased in vigor and complexity as the child progresses, the children can be brought up to adult life with very different physique from that which is so commonly seen at the present day. One of the most serious phases of the educational aspect of the problem is that since this slender type is sensitively and nervously organized, with distinct nervous instability, intellectual training must necessarily increase this instability, unless with the intellectual training the training of the body is insisted upon so that the proper physical support is given for the mental development. If education is approached in this manner it is a blessing, but if the intellectual aspect alone is held it must, in so far as this slender type is concerned, be harmful both to the individual and to the race.

One would certainly be a pessimist of the most profound type if he felt that the splendid work of our profession along preventive medical lines was a curse to the race by preserving the lives of the slender or delicate physical type, which Nature, in keeping with the law of the survival of the fittest, would have thrown off, or that the splendid work of the school and col-

lege is also harmful to the race by accentuating qualities of weakness; but such must be the fact, unless something else is added to the mere saving of the lives and to the common system of education as it exists today. If the physician and the teacher recognize these facts and apply the natural principles for the proper development of these individuals, the result must be inevitable—a stronger and finer race.

What higher incentive can there be for work that that which benefits the individual and at the same time by helping him gradually removes the weaker elements, which if perpetuated would surely lower the vitality of the race as a whole? The free will of choice with which man is endowed and upon which his moral development depends seems to find a similar responsibility in the development of a better and better creature along physical lines, and this development, as is true with the other, follows simple and understood laws. What greater incentive for one's best endeavor could a man desire than to become conscious of the greatness of this opportunity? In the moral choice man is given great responsibility and in the physical the responsibility is none the less great, unless the development of the human family is to be governed by the same law of survival of the fittest and natural selection which has governed the development of the lower forms of life. That man has for his future something better than these laws would make possible, everyone must feel who has thought at all beyond the needs of the day, and in the hope of stimulating thought and activities along these lines this contribution is presented.

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